

**USG
Industrial &
Specialty
Solutions**

Endless possibilities.



**USG INDUSTRIAL
PLASTERS &
GYPSUM CEMENTS**

USG 
IT'S YOUR WORLD. BUILD IT.®

USG INDUSTRIAL PLASTERS & GYPSUM CEMENTS

USG's professional line of industrial plasters and gypsum cements offer viable solutions to industrial product and process issues, as well as unique product development opportunities. From the industry-leading USG Hydrocal® Brand product line to task-specific industrial plasters and gypsum cements, our exceptional products:

- Simplify a variety of manufacturing applications
- Are easy to use and handle
- Retain desirable physical properties

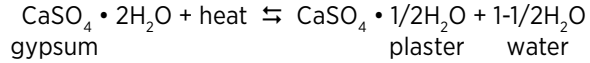
Create unique art pieces, fine detail replications and large scale productions—the possibilities are endless. For more information on USG Industrial Plasters and Gypsum Cements, visit usg.com, contact your local USG sales representative or call 1-800-621-9523.

GYP SUM

INDUSTRIAL PLASTERS & GYP SUM CEMENTS

Gypsum is the base mineral of high performing USG Industrial Plasters and Gypsum Cements. This highly versatile, basic mineral is finely ground and calcined to produce a powder with uniform chemical and physical properties. In manufacturing industrial plasters and gypsum cements, a portion of the chemically combined water is removed by calcination.

The chemical equation that expresses the calcination of gypsum to form plaster is:



In the presence of water, the plaster will revert to gypsum (this is the setting action).

HOW DO INDUSTRIAL PLASTERS AND GYP SUM CEMENTS DIFFER?

The difference is mainly in the size and shape of the crystals formed during the manufacturing process. This difference in crystalline structure has the following effects:

- Industrial plasters require 45 – 160 lbs. (20 – 73 kg) of water per 100 lbs. (45 kg) of plaster to achieve good workability
- Gypsum cements require 22 – 45 lbs. (10 – 20 kg) of water to achieve good workability

COMPATIBILITY WITH OTHER CHEMICALS, AGGREGATES

Industrial plasters and gypsum cements readily blend with chemicals and aggregates to achieve special properties. Both wet and dry blending are done with various chemicals, powders and granular materials. These include:

talc	iron oxide	kaolin
resins	ball clay	sand
perlite	starches	pigments
dyes	vermiculite	foaming agents
wood fiber	polymers	glass/polymer fibers
powdered glue	set-time control additives	

Note Except for special gypsum cement formulations, do not use coarse aggregates (gravel, stone, rip-rap, or any aggregate larger than 10 mesh) as gypsum crystals do not readily bond to them.

FIRE RESISTANCE AND NONCONDUCTIVITY

Industrial plasters and gypsum cements are noncombustible. With a coefficient of thermal conductivity (k) of 0.25 to 4.0, depending on density and additives, these materials assist in fire resistance. When exposed to heat, they do not exceed 212 °F (100 °C) until three quarters of the chemically combined water is driven off. At about 1800 °F (982 °C), the CaSO₄ portion dissociates into quicklime (CaO) and sulfur trioxide (SO₃). Dry gypsum is electrically nonconductive and makes a good insulating medium.

STORAGE AND USE

When properly used, USG Industrial Plasters and Gypsum Cements are easy to work with. All USG Casting Plasters and Gypsum Cements comply with the federal Labeling of Hazardous Art Materials Act, 12 U.S.C. Section 1277 and ASTM D4236. Keep indoors at temperatures between 65 °F – 75 °F (18 °C – 24 °C) and 45% – 55% RH. Do not stack more than two pallets high. Keep from drafts. Rotate stock. USG Industrial Plasters and Gypsum Cements should be used within six months of the manufacturing date located on the package. Always follow handling and use directions and safety warnings on the package.

BENEFITS

CONTROLLABLE SET TIME

Industrial plasters and gypsum cements provide a controllable setting performance that few other materials offer. By adding accelerators or retarders, you can shorten or lengthen its setting time as well as reproduce setting times from batch to batch. Industrial plasters and gypsum cements offer:

- A broad range of set times, from approximately 3 minutes to 20 hours
- Controllable demolding times, allowing for productivity optimization

Note Plaster sets with a sharp, definable, measurable action and sets faster than typical Portland cements and other cementitious materials.

CONTROLLABLE EXPANSION

Among cementitious materials, only industrial plasters and gypsum cements offer controllable expansion—ranging from 0.05% to 1% linear expansion. These formulations can come closer to zero expansion than many other materials. Controllable expansion:

- Ensures high dimensional accuracy
- Ensures duplication of fine detail
- Provides a positive mechanical key when poured into a cavity

EASE OF USE

Industrial plasters and gypsum cements can be fabricated or used in five main ways:

1. Mixed as a fluid slurry, it can be cast or sprayed
2. Worked in a plastic state by screeding or template forming
3. Pressed between dies as a semi-wet powder
4. Carved or machined as a solid
5. In the plastic state can be vibrated into detailed molds for higher strength and accurate reproduction

In **fluid slurry form**, plaster pours easily into flexible or rigid molds. The viscosity ranges from nearly water to molasses. Plaster captures fine detail and can be parted from any nonporous surface. Properly formulated, it can be self-leveling and pump-able.

In **plastic mass form**, plaster can be built up, troweled, added to, scraped away or sculpted as easily as clay. Viscosity ranges from that of butter to modeling clay. Plaster can be applied as a plastic mass to virtually any contour and will set in place to produce a reverse contour.

In **solid form**, casts from plaster formulation can be carved or machined using conventional tools and equipment, including numerically controlled milling equipment.

SOLUBILITY

Among casting materials, only industrial plasters and gypsum cements are self-cleaning in the mold—a basic requirement in the ceramics industry. This is due to the slight solubility of gypsum (about two grams per liter of distilled water).

Note If reduced solubility is not required, gypsum cements can be formulated to meet conditions—it's that versatile.

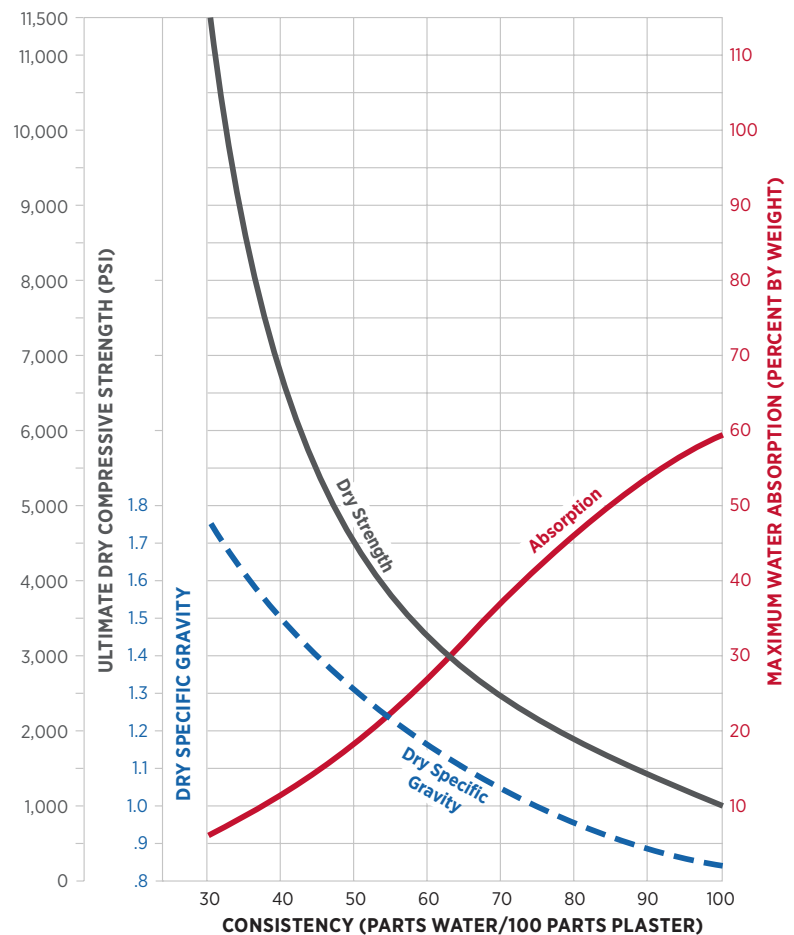
BENEFITS

CONTROLLABLE STRENGTH, ABSORPTION, DENSITY

Among commercial materials, only industrial plasters and gypsum cements possess extreme ranges in strength, absorption and density. Industrial plasters and gypsum cements offer:

- Compressive strengths (and hardness) that can range from that of the weakest chalk to four to five times greater than concrete
- Absorptions that can equal that of a rigid sponge to an impervious surface that sheds water
- A wide range of densities

This great range occurs by selecting the appropriate plaster formulation, then controlling the amount of mixing water. The graph below indicates how you can obtain this range through predictable control of desired characteristics.



Consistency vs. strength, absorption and specific gravity.

DRYING

To attain uniform results and optimum physical properties, plaster casts must be properly dried. Drying equipment can be designed to remove excess water in a specified time and at a predetermined cost. For more information, see *Drying Plaster Casts Installation Guide* (IG502) at usg.com.

USG INDUSTRIAL PLASTERS

USG Dental Plaster - Impression—designed for use in oral impression work where very fast set times are needed. Easy to use and offers many applications for dental stones. Its set time can be altered by the use of accelerators or retarders, water soluble – it requires no organic solvents for cleanup.

USG Dental Plaster - Laboratory—designed for use in oral impression work where very fast set times are needed. Easy to use and offers many applications for dental stones. Its set time can be altered by the use of accelerators or retarders, water soluble – it requires no organic solvents for cleanup.

USG Dental Plaster - Regular—designed for use in oral impression work. Easy to use and offers many applications for dental stones. Its set time can be altered by the use of accelerators or retarders, water soluble – it requires no organic solvents for cleanup.

USG Duramold® Pottery Plaster—has high wet strength for less breakage in process and extended mold life. Used at a lower consistency than conventional pottery plasters and is ideal for jigger mold manufacture.

USG No. 1 Casting Plaster—an excellent product for manufacturing figurines, plaques and lamp bases. Produces a harder working surface with reduced paint absorption.

USG No. 1 Moulding Plaster—a high purity general purpose plaster that can be used in a wide variety of applications including architectural ornamentation and dental use.

USG No. 1 Pottery Plaster—the best material available for sanitaryware and dinnerware casting. Formulated for long life and reduced breakage which leads to stronger molds. Available with or without thermal shock additive.

USG Pottery Plaster—an economical all-purpose pottery plaster. Specifically formulated for most slip casting applications in the ceramic industry, it produces more absorbent pottery molds.

USG Puritan® Pottery Plaster—the best material available for mechanical clay-forming machinery. Stronger than USG No. 1 Pottery Plaster, it is ideal for jigger mold manufacture and is available with or without thermal shock additive.

USG Tuf Cal™ Plaster—USG's premier product for producing large hollow castings. Has high early strength and excellent chip resistance.

USG White Art Plaster—specially formulated interior casting plaster used to create hollow and solid novelty art castings such as statues and lamps. Gives excellent detail and produces a harder working surface with reduced paint absorption.

TYPICAL PHYSICAL CHARACTERISTICS—INDUSTRIAL PLASTERS

USG Product	Normal Consistency (lbs. water/100 lbs. product)	Hand/Machine Mix Vicat Set, Target (minutes)	Compressive Strength, One Hour After Set (psi)	Compressive Strength, Dry (psi)	Density, Wet (lbs./cu.ft.)	Density, Dry (lbs./cu.ft.)	% Maximum Expansion
USG Dental Plaster – Impression	63-73	10-20 (hand mix)	n/a	2000	100	72	0.20%
USG Dental Plaster – Laboratory	63-73	7-10 (hand mix)	n/a	2000	100	72	0.20%
USG Dental Plaster – Regular	63-73	15-30 (hand mix)	n/a	2000	100	72	0.20%
USG Duramold® Pottery Plaster	60	14-24 (machine mix)	1200	2900	102	75	0.21%
USG No. 1 Casting Plaster	60-66	25-50 (hand mix)	1200	2400	100	72	0.21%
USG No. 1 Moulding Plaster	63-70	25-50 (hand mix)	850-1250	1700-2500	99	70	0.15%–0.20%
USG No. 1 Pottery Plaster	70	14-24 (machine mix)	1000	2400	99	69	0.21%
USG Pottery Plaster	77.5	14-24 (machine mix)	800	1600	97	66	0.19%
USG Puritan® Pottery Plaster	67.5	14-24 (machine mix)	1000	2700	101	72	0.21%
USG Tuf Cal™ Plaster	48	27-37 (hand mix)	2650	6000	101	72	0.30%
USG White Art Plaster	65-70	25-50 (hand mix)	1000	2000	99	69	0.21%

Notes

1. Data in chart above applies only to USG Southard plant products.
2. For more information, please see the individual product submittal sheets and Safety Data Sheets (SDS) at usg.com.

USG GYPSUM CEMENTS

USG Ceramical® Gypsum Cement—low consistency, smooth-wearing mold material for use in pressing clayware. Low absorption. Specified for use with RAM automatic clay-forming equipment.

USG Hydrocal® A-11® and Hydrocal® B-11® Gypsum Cement—high strength gypsum cements that offer extreme accuracy. USG Hydrocal A-11 Gypsum Cement has a low setting expansion and is used for production of master models and Keller™ duplicating machines. It adapts to production on hard, strong, tough patterns and duplicator models. Recommended for slurry casting techniques, this white gypsum cement has a shorter period of plasticity. USG Hydrocal B-11 Gypsum Cement is specifically designed for making die-sinking patterns by the splash-cast technique and original loft template models. This gray gypsum cement has a high degree of plasticity and gradual setting action. Both products are water soluble – there is no need for organic solvents for cleanup.

USG Hydrocal® B-Base® and Hydrocal® C-Base® Gypsum Cement—hard and dense bases that are easy to use and water soluble – there is no need for organic solvents for cleanup. USG Hydrocal B-Base Gypsum Cement is used in a variety of applications including investment casting and dental use; USG Hydrocal C-Base Gypsum Cement can be used in architectural ornamentation, dental and general use, among other applications. Both products' set time can be altered using accelerators or retarders.

USG Hydrocal® FGR 95 and FGR 115 Gypsum Cement—high-strength gypsum cement specially formulated for use with glass fiber for fabricating glass-reinforced architectural details. Low water requirements result in high-strength, high-density glass fiber-reinforced gypsum pieces. Ideal for producing lightweight, thin-cast, fire-resistant architectural casts, both products offer superior fabrication flexibility. USG Hydrocal FGR 95 is exceptionally quick setting and accepts most coatings and finishes; USG Hydrocal FGR 115 is adaptable to complex patterns and is suitable for decorating with a variety of finishes. Both products overcome building fire code incompatibilities faced by many plastics – at roughly one-third the cost of filled polyesters.

USG Hydrocal® Statuary Gypsum Cement—a good multi-purpose product for people looking to upgrade from a standard plaster product to one that has a higher degree of hardness and impact. Designed for solid and hollow casting, it is compatible with numerous color pigments and is ideal for giftware and lamp base applications.

USG GYPSUM CEMENTS continued on page 10.

TYPICAL PHYSICAL CHARACTERISTICS—GYPSUM CEMENTS

USG Product	Normal Consistency (lbs. water/100 lbs. product)	Hand/ Machine Mix Vicat Set, Target (minutes)	Compressive Strength, One Hour After Set (psi)	Compressive Strength, Dry (psi)	Density, Wet (lbs./cu.ft.)	Density, Dry (lbs./cu.ft.)	% Maximum Expansion	% Final Expansion
USG Ceramical® Gypsum Cement	30-32	16-22 (machine mix)	4000	10,000	113	96	0.165	n/a
USG Hydrocal® A-11® Gypsum Cement	42-44	14-26 (hand mix)	2200	4500	112	94	0.140	0.08%
USG Hydrocal® B-11® Gypsum Cement	44-46	18-30 (hand mix)	1800	4500	111	91	0.075	0.09%
USG Hydrocal® B-Base™ Gypsum Cement	40-44	20-35 (hand mix)	2600	6000	111	91	0.425	0.425
USG Hydrocal® C-Base™ Gypsum Cement	30-35	15-30 (hand mix)	4000	10,000	116	105	0.350	0.350
USG Hydrocal® FGR 95 Gypsum Cement	31-36	45-75 (hand mix)	5000	10,000	116	105	0.350	n/a
USG Hydrocal® FGR 115 Gypsum Cement	31-35	80-150 (hand mix)	5000	10,000	116	105	0.350	n/a
USG Hydrocal® Statuary Gypsum Cement	31-35	15-25 (hand mix)	3000	6000	110	90	0.42%	n/a
USG Hydrocal® White Gypsum Cement	40-41	20-30 (hand mix)	3000	6000	110	90	0.42%	n/a
USG Hydro-Stone® Gypsum Cement	32	19-25 (hand mix)	4000	10,000	119	108	0.24%	n/a
USG Hydro-Stone® Super-X Gypsum Cement	22	17-20 (hand mix)	6500	13,000	127	125	0.20%	n/a
USG Tufstone® Gypsum Cement	31	16-22 (hand mix)	4000	10,000	122	112	0.24%	n/a
USG Ultimate Drystone™ Casting Media	18-20	18-24 (hand mix)	7000	16,000	n/a	128	0.275%	n/a
USG Ultracal® 30 Gypsum Cement	33-38	18-30 (hand mix)	2000	6500	116	103	n/a	0.08%
USG Ultracal® 60 Gypsum Cement	33-38	50-85 (hand mix)	2000	5500	116	103	n/a	0.07%

Notes

1. Data in chart above applies only to USG Southard plant products.
2. Testing was performed at normal or test consistency.
3. For more information, please see the individual product submittal sheets and Safety Data Sheets (SDS) at usg.com.

USG GYPSUM CEMENTS CONT.

USG Hydrocal® White Gypsum Cement—a good multi-purpose product for people looking to upgrade from a standard plaster product to one that has a higher degree of hardness and impact. Designed for solid and hollow casting, it is compatible with numerous color pigments and is ideal for giftware and lamp base applications.

USG Hydro-Stone® Gypsum Cement—an excellent product for manufacturing solid cast architectural, art novelty and statuary products. Extremely hard, has high compressive strength, and has high water absorption resistance while giving extremely fine detail duplication.

USG Hydro-Stone® Super-X Gypsum Cement—an excellent product for manufacturing solid cast architectural, art novelty and statuary products. Extremely hard, has high compressive strength, and has high water absorption resistance while giving extremely fine detail duplication.

USG Tufstone® Gypsum Cement—uniquely formulated with fibers to withstand three times the impact resistance of standard plaster materials. Designed for solid casting, it is ideal for giftware applications, has excellent resilience and chip resistance and is compatible with numerous color pigments.

USG Ultimate Drystone™ Casting Media—a unique product that requires no oven drying – you can cast, paint, package and ship in one day. Offers excellent duplication of fine detail, high compressive strength and a high density that provides a quality feel. Ideal for solid cast pieces, it is formulated to increase chip resistance and is an excellent alternative to polyester resin.

USG Ultracal® 30 and Ultracal® 60 Gypsum Cement—recommended when extreme accuracy and greater surface hardness are required (as in duplicator models). Designed for the pattern-making industry as the ultimate gypsum cement tooling medium, they provide low expansion properties, gradual set and a long period of plasticity. USG Ultracal 30 Gypsum Cement is ideal for splash-casting molds and models for phenolic, polyester and epoxy resins; USG Ultracal 60 Gypsum Cement is ideal for very large models where additional working time is required. Both are noncombustible and water soluble – there is no need for organic solvents for cleanup.

USG INDUSTRIAL PLASTERS & GYPSUM CEMENTS APPLICATIONS CHART

USG PRODUCT	3-D CASTING	ARCHITECTURAL	CERAMICS	DENTAL	GENERAL PURPOSE	STATUARY	TRADITIONAL TOOLING
INDUSTRIAL PLASTERS							
USG Dental Plaster – Impression				X			
USG Dental Plaster – Laboratory				X			
USG Dental Plaster – Regular				X			
USG Duramold® Pottery Plaster			X				
USG No. 1 Casting Plaster	X	X			X	X	
USG No. 1 Moulding Plaster	X	X			X	X	
USG No. 1 Pottery Plaster			X				
USG Pottery Plaster			X				
USG Puritan® Pottery Plaster			X				
USG Tuf Cal™ Plaster	X					X	
USG White Art Plaster	X	X				X	
GYPSUM CEMENTS							
USG Ceramical® Gypsum Cement			X				
USG Hydrocal® A-11® Gypsum Cement							X
USG Hydrocal® B-11® Gypsum Cement							X
USG Hydrocal® B-Base™ Gypsum Cement				X	X		X
USG Hydrocal® C-Base™ Gypsum Cement				X	X		
USG Hydrocal® FGR 95 Gypsum Cement		X					
USG Hydrocal® FGR 115 Gypsum Cement		X					
USG Hydrocal® Statuary Gypsum Cement						X	
USG Hydrocal® White Gypsum Cement	X				X	X	
USG Hydro-Stone® Gypsum Cement						X	X
USG Hydro-Stone® Super-X Gypsum Cement						X	
USG Tufstone® Gypsum Cement	X					X	
USG Ultimate Drystone™ Casting Media	X	X				X	
USG Ultracal® 30 Gypsum Cement							X
USG Ultracal® 60 Gypsum Cement							X

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

CONTACT INFORMATION

United States Gypsum Company
550 West Adams Street
Chicago, IL 60661

CUSTOMER SERVICE

800 621.9523

TECHNICAL SERVICE

800 USG.4YOU (874-4968)

WEBSITES

usg.com
plaster.com

CAUTION

When mixed with water, this material hardens and becomes very hot sometimes quickly. DO NOT attempt to make a cast enclosing any part of the body using this material. Dust from mixing may cause irritation to eyes, skin, nose, throat and upper respiratory tract. Use only in a well-ventilated area, wear a NIOSH/MSHA-approved respirator. Wear eye protection. If eye contact occurs, flush thoroughly with water for 15 minutes. If on skin: Wash with plenty of water. If swallowed and/or irritation persists, call physician. For more information call Product Safety: 800-507-8899 or see the SDS at usg.com **KEEP OUT OF REACH OF CHILDREN.**

NOTE

The information in this document is subject to change without notice. USG Corp. assumes no responsibility for any errors that may inadvertently appear in this document. Consult your USG Company sales office or representative for information.

NOTICE

We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss cause by application of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within thirty (30) days from date it was or reasonably should have been discovered.

SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.